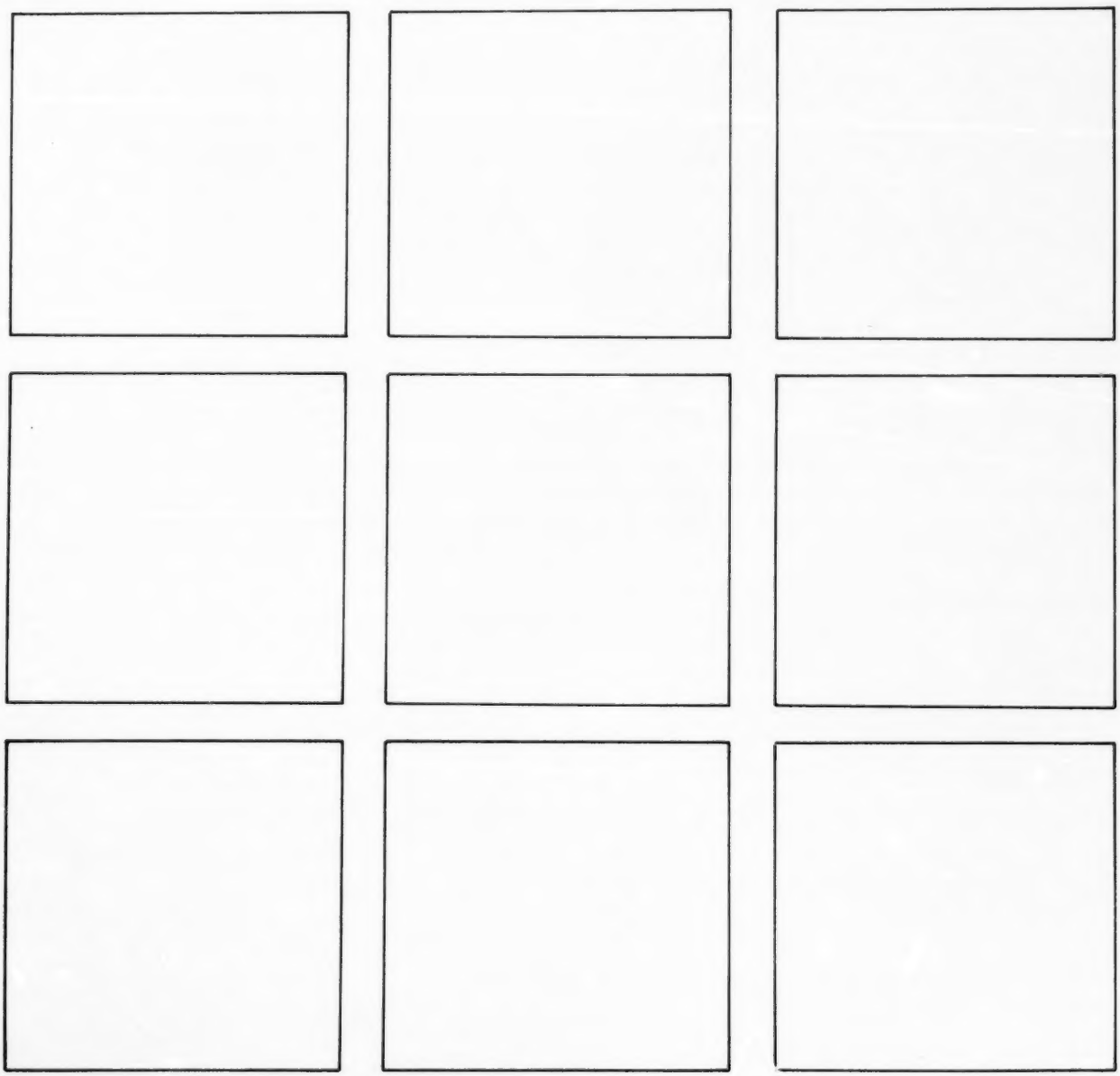
Ontario
Waste Management
Corporation
System
Development
Project

The Proctor & Redfern Group

Technical Proposal Waste Quantities Study



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TASK ORDER RESPONSE

TASK ORDER 01:
WASTE QUANTITIES STUDY

NOVEMBER 1981

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Figure 1: Project Team

APPENDIX: Curriculum Vitae

1.0 INTRODUCTION AND OBJECTIVES

1.0 INTRODUCTION AND OBJECTIVES

This technical proposal is submitted to the Ontario Waste Management Corporation's core staff describing the methodology and costs required to study liquid industrial waste and hazardous waste generation in the Province of Ontario. It is recognized that this is an extremely important task, as the data generated from this project will form the fundamental basis for all later decisions in formulating Ontario Waste Management Corporation's plan to fulfill their mandate to provide facilities for recovery and/or treatment and the safe disposal of liquid industrial waste and hazardous waste in the Province of Ontario.

The major objectives of this study are:

1. To determine the types, quantities and sources of liquid industrial waste and hazardous waste generated in the Province of Ontario. The data generated from this survey will be used to establish the process technologies the OWMC must provide to recover and/or treat and dispose of those wastes.

2. To estimate the growth or decline of wastes requiring OWMC treatment facilities between now and the year 2000.

3. To identify existing facilities now recovering and/or treating these wastes.

4. To prepare a monitoring program to allow update of the data base.

2.0 TECHNICAL PROPOSAL

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Liquid industrial waste and hazardous waste generation in the Province of Ontario will be quantified for the 1980s and estimates will be made to the year 2000. Using appropriate projection approaches and techniques as discussed later in this section, the objectives of the waste quantities study can be accomplished in 4 phases incorporating 16 distinct activities.

PHASE I: INITIAL DATA ASSEMBLY	• Activity 1.	Define Applicable Wastes
	• Activity 2.	Determine Study Methodology and Approaches
	• Activity 3.	Prepare Geographic Distribution of Waste Generators
	• Activity 4.	Collect Available Data
	• Activity 5.	Identify and Evaluate Existing Practices
	• Activity 6.	Arrange Technical Interviews
	• Activity 7.	Conduct Technical Interviews
PHASE II: DATA ANALYSIS	• Activity 8.	Growth Projections and Estimates
	• Activity 9.	Preliminary Data Analysis to Test Methodology and Identify Feedback Mechanisms
	• Activity 10.	Computer Analysis of Existing Data
	• Activity 11.	Establish Active Data Files and Update Mechanisms
PHASE III: GENERATOR'S SURVEY	• Activity 12.	Determine and Schedule Industry Interview Program
	• Activity 13.	Generator Interviews
	• Activity 14.	Survey Data Analysis and Update of Computer Data Files
PHASE IV: REPORT	• Activity 15.	Prepare Draft Report
	• Activity 16.	Prepare Final Report

OWMC Core Staff input will be facilitated by the regular preparation and filing of Progress Reports by the Project Team. Progress Reports are intended to describe work to be undertaken before preceeding into a study activity or phase. Each Progress Report also coincides with a Decision Point. A list of contacts, data sources, study techniques, methodology, etc. will be presented to the OWMC Core Staff including why an approach was used or rejected. Costs, manpower expended, financial review, etc. will also be included in the Progress Reports. This will permit the OWMC Core Staff to provide input, change the study direction

and monitor progress of the study at frequent intervals.

2.1 PHASE 1 INITIAL DATA ASSEMBLY

Activity 1: Define Applicable Wastes

Liquid industrial waste and hazardous waste will be defined and categorized based on various criteria as set forth by:

- Ontario Ministry of the Environment
- Environmental Protection Agency (EPA)
- Environmental Protection Service (EPS)
- others such as California Category Number (CACAT No.)

The criteria for different waste classification systems will be reviewed and explained. Waste terminology from Regulation 824 and other sources such as EPA will be collected, reviewed, and listed.

After initial review and compilations, a waste classification system will be developed or selected to meet project requirements. Ontario Ministry of the Environment classification guidelines and the nature of liquid industrial waste and hazardous waste production will be considered along with others to provide:

- a common basis for data reporting
- an acceptable definition for each term used in hazardous waste nomenclature and industrial waste inventory literature.

A system is also required to categorize industries in Ontario. Industrial categories useful to the task and of long term use to the OWMC System Development Project will be developed on the basis of SIC (Standard Industrial Code) classifications and compatibility with systems used by Ministries of the Ontario Government, where possible.

Liquid industrial waste and hazardous waste components in various segments of major industries in Ontario that have traditionally been generating and/or disposing such wastes for many years in municipal sewage treatment plants will be enumerated.

Activity 2: Determine Study Methodology and Approaches

Several methodologies and approaches employed in California, Minnesota, New York, Ontario, and other Provinces in Canada for liquid industrial waste and hazardous waste generation surveys and inventories will be studied and evaluated for each segment of the major industries under consideration. Waste generation rates and factors for each waste type and industrial category or segment will be developed based on:

- number of employees
- plant size and number, or
- amount of product manufactured per unit time (a year, month, or week basis).

The methodology developed and approaches used will be illustrated in detail.

Ontario industries that generate liquid industrial waste and hazardous waste and will be grouped by Standard Industrial Classification (SIC). The liquid industrial waste and hazardous waste generation (bridging) factors developed in other studies will be adjusted to the Ontario situation using productivity differentials and other means. Available data sources such as the Ministry of Industry and Tourism, Ministry of the Environment, Canadian Chemical Producers Association (CCPA), Dun & Bradstreet, Statistics Canada, Waste Materials Exchange, and others will be reviewed to ensure that the methodology selected can make use of the best available data.

Activity 3: Prepare Geographic Distribution of Waste Generators

Areas of geographic distribution will be established by:

- regional clustering of industries
- waste types and sources
- industrial grouping or category, and
- other suitable administrative, political, or functional boundaries.

This is necessary for survey, reporting, and monitoring purposes in addition to treatment facility site selection.

This information will be based upon the aggregation of firm and specific location data expected to be avail-

able from the Ontario Ministry of Industry and Tourism records.

Industrial plants of various sizes within each category, type and amount of waste generated, and any disposal facilities will be mapped and data sources will be identified with specific reference to cities, counties, districts and regions.

*** A progress report will be submitted for review and comment to the Core Staff based on the work accomplished in Activities 1-3 and prior to detailed data collection. Any policy or decision inputs thus obtained will be used to clarify or modify the classification systems or methodologies developed to this point.

Activity 4: Collect Available Data

Existing Ontario data and information from other regions of North America will be assembled for quantitative analysis and tested for its reliability and accuracy. Interface with other projects now underway will occur and may provide support to this project (cross-comparison data or additional data). Published and tabulated data would be considered for industrial employment, industrial production and activity, and growth projections. State-of-the-art literature and trend information for industrial sectors will be assembled for Ontario as well as for out-of-province settings. This hard data would complement and serve as a precursor to data obtained in the Technical Interview Program (Activities 6 & 7) and Generators Survey (Activities 12 & 13).

Activity 5: Identify and Evaluate Existing Practices

Waste treatment, recovery, reduction, processing, and disposal facilities in Ontario will be identified and evaluated. Waste exchange within the Province and transport into or out of the Province will be recorded from existing information, if any. Waste storage areas and sites within the Province will also be identified.

Activity 6: Arrange Technical Interviews

From information collected in Activities 1 through 5, it will be determined what information is available and from this, what data gaps exist and must be filled by technical interviews. Once a list of the missing information and data gaps is prepared, several industrial spokesmen, trade and commerce representatives and leaders, federal and provincial government administrators, researchers and officers, and industrial process specialists will be contacted to arrange for interviews

to provide the desired statistics or factual opinions. About 20 such technical interviews will be carried out by teams of 2 persons - one technical person and another non-technical person with skills in the interviewing process. Senior professionals will be trained for the interview process; the interviewees will be notified in advance of the intent of the interview, areas of interest, types of questions that will be asked and the desired information. Sample questions that may be asked are:

- What is a particular industry doing about mitigating the effects of waste generated in Ontario?
- What technological changes are anticipated in the particular industrial segment with reference to product manufacture, waste generation and treatment?
- What will the industrial growth pattern be for 1980s and 1990s?
- Will the number of employees in an industry significantly change?

*** A progress report will be submitted to the Core Staff describing the survey technique, interview schedule and identifying who will be interviewed and why.

Activity 7: Conduct Technical Interview

Once the interviews have been arranged, the interview teams will visit with the interviewees for the desired information on several aspects of the industry. These may include:

- future growth potential and past growth pattern of the industry in Ontario
- expansion of resource recovery and waste exchange programs
- handling, storage, treatment, recovery, reduction, and processing of waste by a particular industry in question, and
- approaches and methodologies used for forecasts and projections in employment (number of employees), expansion or decrease in number and size of industrial plants or waste treatment facilities, technological changes to product manufacture, etc.

2.2 PHASE II DATA ANALYSIS

Activity 8: Growth Projections and Estimates

A growth projection methodology or model will be developed or selected for each industrial segment based on the available information. Each methodology or model will be utilized to estimate waste generation to the year 2000. Proposed technical changes by industry and their impacts on future waste generation will be assessed. Depending upon the information derived from technical interviews, a high growth rate scenario and a low growth rate scenario will be projected for each waste category and/or industrial segment.

Activity 9: Preliminary Data Analysis to Test Methodology and Identify Feedback Mechanisms

Data available from waste generators and other base sources will be used to test the methodology. Estimates of quantity, type and source of the total liquid industrial waste and hazardous waste streams will be compiled. Waste generation factors, often referred to as bridging factors, will be applied to data by industrial category. The contribution of unreported generators will be estimated by assignment of industrial production to under-reported industrial categories by area. Data obtained in Activity 4 and Activity 7 will be subject to preliminary analysis to test the methodology developed or selected for each industrial segment and waste category. A feedback mechanism in each methodology will be established to improve the waste quantity estimates and to update the bridging factors, as more information becomes available in Activities 12 and 13.

*** A progress report based on these preliminary analyses will be prepared for the Core Staff's overview and feedback prior to detailed computerized processing of the entire data base. A meeting between the Project Team and the OWMC Core Staff will be held at this time.

Activity 10: Computer Analysis of Existing Data

To estimate the quantity, types, and sources of liquid industrial waste and hazardous waste to the year 2000, a computerized processing of the entire data base will be necessary. The results of this detailed and comprehensive analysis will be compared with other estimates of expected waste generation to specific industries. This will assist in:

- pointing out the scope and nature of Ontario's liquid industrial waste and hazardous waste problem
- ground-truthing the reported waste generation data

and determining the actual industrial sites that must be visited in Activities 12 and 13

- identifying the deficiencies and problems of the methodology and approaches used, and
- establishing the data files for subsequent users of this study's output.

*** The results of this detailed analysis will be presented to the Core Staff and a critical discussion on the methodology and/or waste classification system will be initiated to receive constructive viewpoints. Project progress to date will be reported and remaining activities in Phase III and Phase IV will be outlined.

Activity 11: Establish Active Data Files and Update Mechanisms

Waste generation data, with complete programming on data analysis, will be stored on computer disks and data files will be established such that all or portions of it can be reproduced for subsequent uses.

An update mechanism will also be established in the computer data files to upgrade or improve the estimates of waste quantities as new data sources reveal significant and reliable information. A copy of the detailed computer data file will be given to the Core Staff for their subsequent use.

2.3 PHASE III GENERATOR SURVEY

Activity 12: Determine and Schedule Industry Interview Program

Interviews will be arranged with appropriate industrial plant personnel. Interviews will be scheduled on the basis of a stratified sampling strategy that would seek to target firms by size range in each industrial category. Emphasis will be placed on industries where the analysis of existing data (Activity 10) shows greatest divergence among waste generation estimates.

A team of two persons will be deployed for each interview. A budget for 75 plant site interview-inspections has been set. Five interview teams will be necessary to cover the entire industrial field interview work within 15 working days. On each team, there will be a technical person with background in industrial waste management and a person with background in the interviewing process. All interviewers will receive training.

Appropriate survey instruments (letters of introduction, questionnaires, etc.) will be developed. Every opportunity will be taken to gather a data base useful for other tasks in the OWMC System Development Project.

*** A progress report will be submitted for review and comment to the Core Staff prior to conduct of the interviews. This will include a list of interviews, interview schedule, rationale for interview selection, etc.

Activity 13: Generator Interviews

Interview teams will gather the desired information and data from the representatives of the industrial plant at site. The data and completed interview reports will be submitted to the Task Manager on the same day or week, as agreed upon. This will reduce the possibility of any confusion among different respondent's replies and minimize chances of human error. The Task Manager will go over the generators' survey interview information and data obtained by all the teams.

Activity 14: Analysis of Survey Data and Update of Computer Data Files

The information gathered from the interviews will be coded for computer handling and composite data analysis. Waste quantity projections by waste stream types, generating region, sources, and other bases will be provided for a suitable short term and a long-term planning horizon. Using the recommended system for updating both the waste generation factors (or bridging factors) and the waste estimates, the established data files (Activity 11) will be updated.

*** At the end of this activity, a progress report will be submitted for review and comment to the Core Staff on the results of the survey program and the impact of the new data on existing data files and study reports.

2.4 PHASE IV REPORT

Activity 15 Prepare Draft Report

Compilation of a Draft Report will require pooling of all activities in a sensible, comprehensive, and logical or systematic form. A full meeting with the OWMC Core Staff will be held for the decision s on format and technical preparation of the Draft Report. The presentation of the material will be such that it will provide interface with the:

- generic process technologies study
- waste reduction opportunities study
- pricing and marketing considerations in waste management plans, and
- subsequent use of data files and update mechanisms for waste generation factors.

Appropriate appendices and reference sources will be attached. An executive summary of the projec t with key words will also be prepared. Twelve copies of the draft report will be submitted for review and comment.

Activity 16: Prepare Final Report

After receipt of comments and approval from the Core Staff the reviewed draft report will be revised, edited and proof-read for a final copy within a two week period. One camera ready copy and 20 copies of the final report will be transmitted to the Core Staff. A copy of the computer data files will also be made available to the OWMC for storage and subsequent use as a Primary Data Base reference source.

3.0 PROJECT TEAM

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3.1 TEAM ORGANIZATION

The Project Team will operate under the overall supervision of the Task Director, who will provide policy guidance and be responsible to the Client for successful completion of the assignment. Under his guidance, the Task Manager will supervise the day-to-day operation of the Project Team. Senior professionals have been selected from Proctor & Redfern, Weston Consultants and Ontario Research Foundation, with one person from each group selected as the key representative. The project organization is shown in Figure 1.

3.2 PROJECT MANAGEMENT

This assignment represents a challenge in the successful completion of the work within the time and budget available. In order to ensure optimum control of the Project Team, a Critical Path Schedule has been developed by the key team members. The detailed work program and time allocations will enable continuous monitoring of study progress and immediate response to unexpected developments.

*** Seven progress reports and decision points have been identified as part of the work program. This will further enable the Core Staff to provide input at critical points in the work program.

3.3 TEAM MEMBERS

Robert Tait, P.Eng. (P&R) will serve as Task Director. Mr. Tait is a Senior Waste Management Professional with Proctor & Redfern and is Manager of its Hamilton branch office. Mr. Tait, in his 22 years with Proctor & Redfern, has successfully managed a number of significant waste management projects, including the Region of Hamilton-Wentworth Solid Waste Management Project and, most recently, energy-from-waste projects in St. Catharines and the Regional Municipality of Sudbury.

Dr. Roy Ball, P.E. (Weston) will assume Task Management responsibilities. Dr. Ball was formerly Manager of Weston's Conceptual (process) Design Group and is now Manager of its Midwest Regional Office in Chicago. He has managed or directed several hazardous waste management and planning efforts by Weston. Combined with an extensive background in industrial process wastes and residuals management technologies, he is particularly sensitive to the

requirements for successful completion of a project of this magnitude. (NOTE: Dr. Ball left the employment of Weston in January 1982 and was replaced by Dr. Robert Schoenberger.)

Dr. Robert Schoenberger, P.E. (Weston) has assumed task management responsibilities. He has considerable experience in the field of industrial waste management process technologies and waste engineering. Dr. Schoenberger's knowledge of industrial waste streams and waste classification systems will be an invaluable contribution to this study.

John Sedley (P&R) is Senior Economist with Proctor and Redfern. He brings to the project 10 years experience in the economics of solid waste and liquid waste management. This experience, coupled with a sound knowledge of industrial development in Ontario, will be especially useful in the projection of waste generation quantities over the next 20 years.

Jim Browne (Weston) brings strong credentials into the data analysis phase of this project. He has more than 10 years of experience in designing data collection systems and projection analyses. He has been the Manager or Technical Consultant on all recent Weston environmental planning projects with significant data reduction/projection tasks.

Matthew McKim, P.Eng. (ORF) is a chemical and environmental engineer who, prior to joining ORF, was involved in a comprehensive inventory of industrial and hazardous wastes in Atlantic Canada. In addition to the inventory work, a number of different management options for wastes in the Atlantic Provinces were explored in this study.

This project team will be backed up by other professional, technical and support staff from the three participating companies. Also available to the project team will be the consulting services of the OWMC Core Staff. These senior individuals will offer general policy guidance and direction to the task team. Regular interface between team members and the Core Staff will be maintained.

Every member of the Project Team will be available to provide expert testimony in connection with their work on this phase of the project. Diaries and work files shall be used and will be available as supporting documentation supporting their testimony.

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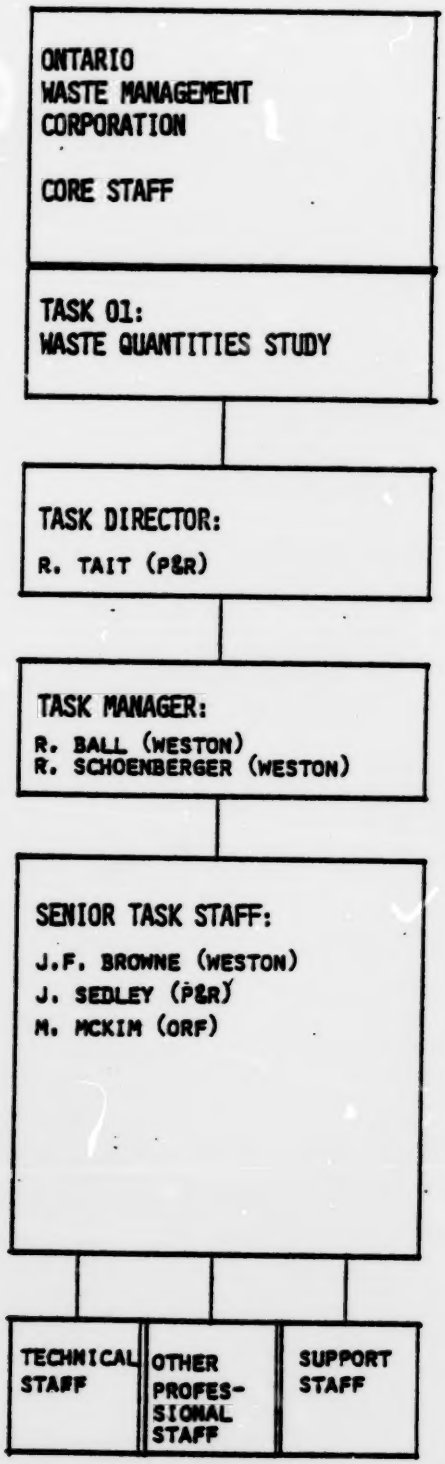
FIGURE I: PROJECT TEAM



APPENDIX: CURRICULUM VITAE

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CURRICULUM VITAE

NAME	Robert Tait, P.Eng.
BIRTH DATE	November 12, 1931
JOINED STAFF	1959
EDUCATION	University of St. Andrews, Scotland, Bachelor of Science (Civil Engineering), 1953
MEMBERSHIPS	Association of Professional Engineers of Ontario Engineering Institute of Canada Institution of Civil Engineers

PROFESSIONAL EXPERIENCE

Mr. Tait initially gained professional experience on the design and resident supervision of dams, bridges, structures, and roads with a large firm of consulting engineers in the United Kingdom.

He joined The Proctor & Redfern Group in 1959 and undertook progressively responsible duties, first as Resident Engineer, and then as Design Engineer and Project Manager on various highway and bridge projects. He also served as Manager of Proctor & Redfern's Ottawa office. In this position he was responsible for business development and project management in Eastern Ontario.

Since 1968, he has been Branch Manager of the Hamilton office, responsible for project management and business development in Hamilton-Wentworth and adjacent areas.

Typical recent assignments include:

- Sanitary sewer projects in Waterdown, Waterford and Hagersville for Ministry of the Environment
- An urban expressway for City of Hamilton
- A study on initial assumption, operation and financing of Regional roads, water, sewage, drainage and solid waste facilities for Regional Municipality of Hamilton-Wentworth
- Preparation of by-laws related to water and sewage facilities in Hamilton-Wentworth and the establishment of rates and charges for the use of these facilities
- A study of the method of charging for the use of the sewage facilities in the Regional Municipality of Halton

Continued over .....

- Sanitary sewage, water supply and solid waste projects for Regional Municipality of Hamilton-Wentworth
- Membership on a Steering Committee appointed by Regional Council responsible for calling tenders, negotiating and implementing a $60M ten year contract for the disposal of solid waste in the Hamilton-Wentworth Region
- Solid waste projects for Regional Municipality of Niagara, City of St. Catharines, Ministry of Energy and for private clients
- A reservoir and pumping station in Simcoe
- Subdivision development for private clients.

Mr. Tait has been designated as a Consulting Engineer and is an Associate of Proctor & Redfern Limited.

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Robert J. Schoenberger, Ph.D., P.E.

Registration

Registered Professional Engineer in the state of Pennsylvania

Fields of Competence

Engineering and geological aspects relating to the design of solid and hazardous waste processing and disposal facilities; design of resource recovery systems; preparation of solid waste management plans for regional agencies; use of waste as a fuel including the environmental impact and air pollution considerations involved in this technology; operation of sanitary landfills; design of secure landfills; and design of waste processing facilities for hazardous wastes.

Experience Summary

Eighteen years experience in engineering practice including 14 years in solid and hazardous waste treatment, handling and disposal. Experience includes research on the combustion of wastes; design of prototype incinerators; operation of sanitary landfills and leachate treatment facilities; and teaching graduate level courses in environmental engineering and science.

Credentials

B.S. Civil Engineering — Drexel University - 1962

Penn State University, Berks Campus - part-time graduate - 1963

M.S. Environmental Engineering - Air Pollution Control and Ground Water Hydrology - Dual Major; part-time - Drexel University - 1965

Ph.D. Chemical and Environmental Engineering - Drexel University - 1969

Public Health Service Traineeship - 1964

Pennsylvania Solid Waste Management Advisory Committee 1968-Present, Chairman 1970-71

Mayor's Science and Technology Advisory Committee, Philadelphia, Environmental Committee

Water Pollution Control Federation

American Society of Civil Engineers

American Society of Mechanical Engineers, Solid Waste Processing Division

Employment History

1978-Present	Weston
1965-1978	Drexel University, Associate Director Environmental Studies Institute Associate Professor Assistant Professor, Lecturer Research Associate
1965-1978	Private Consultant
1962-1965	Pennsylvania Department of Health Engineer in Charge, Facilities Sanitary Engineer II Sanitary Engineer I
1957-1959	Pennsylvania Power and Light Company Engineer Assistant

Key Projects

Evaluation of the Shippensburg, Pennsylvania municipal incinerator for EPA under the Demonstration Grant Program.

Design of two 1000-TPD sanitary landfills including subsurface investigation using test pits, hollow flight auger corings, seismic investigation, leachate collection, selection of liner, leachate treatment and disposal, equipment selection and industrial waste acceptability criteria.

Design of a 1000-TPD RDF resource recovery facility. Evaluation of RDF as a fuel supplement in a utility boiler. Selection of all pertinent equipment including shredders, materials handling, storage systems and magnetic separation.

Design of a treatment system and evaluation of the market potential for an off-site centralized industrial waste treatment plant.

Design of a remedial action program for a sanitary landfill which was the source of methane gas migrating to an adjacent developed area. Investigation of the use of gas at this and one other landfill, including the design of a gas-capture system and transmission network.

Design of a transfer station for drum and barrel handling and reclamation. Station was designed to handle aqueous, flammable and some hazardous wastes.

Professional Profile

Complete inventory of all wastes from two major chemical manufacturers. Surveys included determination of all constituents in the wastes. quantities in all waste categories, methods of handling and recommended methods of final disposal.

Preparation of a remedial action program for a storage impoundment serving a secondary oil refinery in Gloucester County, New Jersey. Work scope included the design of a treatment plant for contaminated rainwater.

Publications

Schoenberger, Robert J. and Purdom, P.W., "Residue Characteristics", J. Sanitary Engineering Division, ASCE, June 1969.

Schoenberger, Robert J., "Leachate Characteristics from Residue Landfills", Proceedings and 2nd Annual Middle Atlantic Industrial Water Conference, November 1968.

Schoenberger, R.J., Purdom, P.W., Levy, S.J. and Hollander, H.I., "Characterization and Treatment of Incinerator Process Waters", Proceedings 1970 National Incinerator Conference, American Society of Mechanical Engineers.

Schoenberger, R.J. and Fungaroli, A.A., "Incinerator Residue Fill Site Investigation", J. Soil Mechanics and Foundation Division, American Society of Civil Engineering.

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CURRICULUM VITAE

NAME	John Sedley
BIRTH DATE	November 4, 1949
JOINED STAFF	1979
EDUCATION	Sir George Williams University, Bachelor of Arts (Economics), Montreal, 1971
MEMBERSHIPS	American Water Resources Association Toronto Association of Business Economists International Association of Energy Economists

PROFESSIONAL EXPERIENCE

Mr. Sedley is a specialist in economic and financial analysis and has been responsible for the evaluation of resource development projects throughout Canada and abroad.

Mr. Sedley's experience in the field of economic analysis began in 1972 with Environment Canada, where he conducted studies of resource development problems in the Peace, Kootenay and Liard River Basins in British Columbia. Immediately prior to joining Proctor & Redfern, Mr. Sedley was responsible for the economic and financial analysis of a wide range of projects in Canada and overseas for Stanley Associates Engineering Ltd.

During his career, he has undertaken a wide variety of projects, including:

- Project economist for the Jamaica Clarendon Plains Development Study, involving extension of irrigation water supplies and upgrading of supporting institutions.

- Project economist for the Barbados Water Resources Study with special emphasis on the financial and economic viability of irrigation schemes.

- Project economist for Jamaica Rural Water Supply Project, involving cost-effectiveness analysis and tariff-setting for water supply schemes in small communities.

- Feasibility study of water supply system expansion for the City of Daegu, Republic of Korea.

- Financial analysis of the impact of possible waste treatment regulations on fruit and vegetable processing operations in Canada.

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- Project coordinator and economic analyst for study of potential coal development in Alberta.

- Economic and financial analyses of energy-from-waste schemes for the City of St. Catharines and Region of Sudbury, Ontario and the University of Alberta.

- Financial analyses of solid waste management schemes in St. Catharines, Burlington and Markham, Ontario and Leduc and Lethbridge, Alberta.

- Economic analysis of infrastructure requirements for communities to be affected by the Cold Lake Heavy Oil Project in Alberta.

- Benefit/cost analysis of a major coal-fired power plant project for Edmonton Power Ltd.

- Cost-effectiveness analysis of alternative schemes for a regional sewerage system in Alberta.

- Analysis of financial prospects of Canadian Government Grain Elevators for a prospective purchaser.

- Prepared brief to the Ontario Royal Commission on Electric Power Planning on behalf of the United Counties of Prescott and Russell.

- Benefit/cost analyses of flood reduction schemes in Fort McMurray, Alberta and Plantagenet, Ontario.

- Financial analysis of using excess steam from Bruce Nuclear Generating Station for industrial processes and greenhouse heating.

James F. Browne

Fields of Competence

Systems simulation and analysis, project management, chemical/environmental engineering, environmental data management and analysis, computer modeling, management information systems design, data acquisition and control, systems engineering, data base management systems, statistical analysis, ambient and source emissions monitoring, emission, inventories, environmental assessments.

Experience Summary

Thirteen years of experience in environmental systems engineering and data management, analysis, and modeling, serving as project manager, group leader, project engineer and departmental manager. Broad experience in the design and implementation of scientific data management, analysis and reporting systems utilized in developing baseline emission inventories, environmental assessments, impact analyses, and ambient and source emission measurements. Field experience includes source and ambient measurements, design and development of continuous data collection and reduction systems, and measurement methods development for both ambient and source level pollutants.

Additional experience includes development and implementation of financial management information systems, scientific/business statistical data analysis and modeling, as well as analytical methodology development.

Credentials

B.S. Chemical Engineering — Drexel University (1967)

Air Pollution Control Association

Association of Computer Machinery

American Institute of Chemical Engineers

Employment History

1980-Present	Weston
1967-1980	Scott Environmental Technology

Key Projects

Six years experience as corporate Manager of Computer Sciences with responsibility for all computer-related activities, both financial and scientific.

Served as Program Manager and principal investigator for several projects which developed and validated a model for predicting pollutant concentrations in the vicinity of toll plazas. These projects were performed under contract to a major metropolitan transit authority.

Designed and implemented data management and analysis systems used in developing baseline emissions inventories for the EPA (piston and turbine aircraft), the U.S. Air Force (turbine engines), the U.S. Coast Guard (Marine power plants), and the California ARB (total marine emissions in California coastal waters - including detailed tracking of all tankers and petroleum transfers in the base year). Held project management responsibility for the data management and analysis phases.

Developed analytical methodology for assessing the environmental impacts of new highway and stationary sources. This methodology was utilized in several projects conducted for the Pennsylvania Department of Transportation and Maryland Department of Transportation, as well as private and industrial clients.

Developed a technical information management library consisting of over 300 software modules for the handling, reporting, and analysis of environmental data.

Member of a three-man team that developed an extensive model for predicting evaporative emissions from motor vehicles, as well as exhaust emissions. Work performed under contract with the American Petroleum Institute.

Responsible for the corporate evaluation, review and installation of an in-house computer system as well as the successful implementation of all associated software systems and an integrated management information system with minimal delays. Included the design and development of an integrated Financial/Project Control Management System as well as a Cylinder Inventory Control, Management and Billing System.

"Hands on" experience with a variety of large- and small-scale computer systems, including Univac 1108,1110, and 90/30, IBM 370 and 1130, as well as several mini-computers. Languages include FORTRAN, COBOL, RPGII, BASIC, and ASSEMBLER.

Professional Profile

ONTARIO RESEARCH FOUNDATION

SHERIDAN PARK RESEARCH COMMUNITY
MISSISSAUGA, ONTARIO, CANADA L5K 1B3 • (416) 822-4111 • TELEX 06-982311

MATTHEW P. McKIM

Associate Research Scientist, Department of Applied Chemistry

EDUCATION

Dip. Tech., Chemical Technology, 1972, Saint John Institute of Technology, New Brunswick
B.Sc., Chemical Engineering, 1977, University of New Brunswick
M. Eng., Environmental Engineering, (Fall 1981), University of New Brunswick

AREAS OF EXPERTISE

Environmental pollution control, product and energy recovery from waste materials; industrial and domestic water and wastewater treatment; industrial fermentation.

EXPERIENCE

- Study for the Canadian Federal Government, Department of the Environment, on "Management of Hazardous Wastes in the Maritime Provinces".
- Process design of industrial and domestic wastewater treatment facilities.
- Evaluation of gasifier performance employing wood and food industry wastes.
- Industrial process design for energy and water conservation.
- Studies on the efficacy of fuel and SCP derived from waste lignocellulose and carbohydrates.
- Computer simulation of industrial processes.
- Computer prediction of contaminant transport.
- Bench scale treatability studies of industrial wastewaters.
- Design and evaluation of bench scale fermentation units.

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of the Province of Ontario

Pollution Control Association of Ontario

Water Pollution Control Federation

PUBLICATIONS

1.(a) "Evaluation of Secondary Treatment Systems for Treating Potato-Processing Wastewater", A.A. Cocci, M.P. McKim, R.C. Landine and T. Viraraghavan, Agricultural Wastes 2, 273-7 (1980).

(b) "Evaluation of Secondary Treatment Systems for Treating Potato Processing Wastewater at McCain Foods Limited, Florenceville, New Brunswick". A.A. Cocci, M.P. McKim, R.C. Landine and T. Viragavahan. Presented at the 1979 CSCE Conference, Montreal, P.Q., June 1979.

2. "Combined Aerobic-Anaerobic Treatment Produces Low Cost, Quality Effluent", M.P. McKim, A.A. Cocci, T. Virarghavan and R.C. Landine, Industrial Wastes May/June 1979, pp 53-5.

3. "Hazardous Wastes Management in Canada". G.B. Ward (University of New Brunswick) and M.P. McKim. Proceedings of the 1981 CSCE Conference, Fredericton, N.B., May 26/27, 1981.

4. "Treatment and Disposal of Hazardous Wastes". Presented at the 64th Annual Conference of the Chemical Institute of Canada, Halifax, N.S., July 1981.

POOR

QUALITY

ORIGINAL